# CAN RISK AVERSE HOUSEHOLDS MAKE RISKY INVESTMENTS? THE ROLE OF TRUST IN OTHERS*

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**Abstract**

Using two waves of the Survey on Health, Ageing and Retirement in Europe (SHARE, 2006-2013), this paper sheds light on the role jointly played by individuals' financial risk attitude and their willingness to trust others in influencing risky assets investments. We observe large variation in risk attitude and trust and we show that risky assets investments are more frequent and larger in households featuring either risk tolerance or (to a smaller extent) a combination of risk aversion and trust. Trust thus acts as an imperfect substitute for risk tolerance. Our findings have implications for understanding heterogeneity in household financial decisions.

Keywords: Portfolio Choice; Risk Attitude; Generalized Trust.
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## 1. Introduction

In the last years, a growing number of studies have been seeking to identify the major determinants of financial risk taking, with special regard to the households' decision to invest in risky assets such as stocks. The existing literature established that financial risk taking is widely heterogeneous in the population and it is highly correlated with individual-level variables, such as gender, education, race (Kimball et al., 2008), age, personal background (Dohmen et al., 2011), as well as health (Rosen and Wu, 2004) and cognitive ability (Christelis et al., 2010). Next, even though financial risk taking seems to be, to some extent, genetically transmitted (Cesarini et al., 2010), individuals' prior life experiences (e.g., passing through a large macroeconomic shock or a major traumatic event such as the death of a child) have been shown to play an important role (Malmendier and Nagel, 2011; Bucciol and Zarri, 2015). These results provide support to the idea that financial risk taking, far from being rigid as traditionally believed, is instead malleable and can be shaped by several life occurrences, including social interactions (Hong et al., 2004; Ahern et al., 2014).

Some recent studies examined the link between portfolio choices and a variable aimed at capturing an inherently 'social' individual attitude such as one's *willingness to trust others* (or one's degree of 'generalized trust'; see in particular Guiso et al., 2008). In this paper, we empirically analyze the correlation of portfolio choices with attitudes towards *risk* and *trust* at the same time. Specifically, we examine the relationship between individual investors' financial risk attitude and their trust in others and shed light on the role that these attitudes *jointly play* in accounting for heterogeneity in investors' portfolio decisions. The paper most closely related to ours is Guiso et al. (2008). However, our work differs from theirs in at least three important respects: i) we look at the same time at several countries rather than at a single one. This way our results should not be influenced by the specific characteristics of one country; ii) we use a measure of risk attitude in the financial domain rather than a general risk attitude measure. We believe that, also based on the recent stream of literature on the theme (see on this Section 2), this is more appropriate as our focus is on portfolio decisions; iii) we investigate the interaction between risk attitude and trust.

The main reason why we examine the interplay between financial risk attitude and trust in others, in their impact on portfolio choices, is twofold. First, even though risk attitude and trust are arguably correlated in many domains (including the financial one) and trust is

sometimes considered to be just one type of risk taking,[1] recent work convincingly documents that these two attitudes involve distinct neural and cognitive mechanisms (Fehr, 2009; Ahern et al., 2014) as well as different intergenerational transmission channels (Dohmen et al., 2012).[2] Secondly, even though we know from previous studies that both variables are independently relevant in influencing investors' portfolio decisions, our major goal is to shed light on their joint influence on individual investment decisions in risky financial assets.

In principle, it might be the case that, at the micro level, risk tolerance and trust are *complements*, in the sense that both are necessary to induce risky financial behavior. In contrast, it might instead be the case that they are *substitutes*, so that a high level of trust might (at least to some extent) compensate for the absence of risk tolerance and be enough for risky financial decisions to occur. Extending classic portfolio theory (Markowitz, 1952), Weber et al. (2013) propose a general risk-return framework positing that changes in risk taking can be the result of changes in one or more of three determinants: Risk attitude, return expectations and risk expectations. In turn, an investor's return and risk expectations are likely to depend not only on her assessment of objective financial parameters, but also on her (subjective) trust in the fairness of the financial game as a whole, i.e. her trust that the overall system is fair (Guiso et al., 2008). Therefore, holding risk attitude constant, in the presence of trust the channel at work could be the following: high (resp., low) trust in others increases (resp., decreases) the expected return and/or decreases (resp., increases) the perceived riskiness of financial investments, as individual investors' level of trust makes them more (resp., less) likely to believe that their financial investments will be successful. This opens up the possibility that, in the presence of a high level of trust in others, even risk averse individuals might end up making risky investment choices.

In our analysis, we rely on self-reported measures of risk attitude and trust in others. Self-assessed measures have proven to be reliable indicators of risk attitude (e.g., Dohmen et al., 2011). Trust in others is assessed through a widely used measure of so called 'generalized trust', that is, the amount of trust that individuals have in strangers, i.e., people they *do not personally know*. To the best of our knowledge, data on self-assessed risk attitude and generalized trust are separately available in several household surveys, but they are treated together only in the 2006-2013 waves of the Survey on Health Ageing and Retirement in

[1] Trust by definition involves an element of risk: If A trusts B, A runs the risk that B betrays A, i.e. acts in a non-trustworthy manner.

[2] Fehr (2009) reviews strong neurobiological, genetic and behavioral evidence showing that trust taking differs significantly from behavior towards non-socially constituted risks, so that trust cannot be viewed just as a special case of risk taking. On this distinction, see also Bohnet and Zeckhauser (2004) and Guiso et al. (2008).

Europe (SHARE). For this reason, SHARE is an ideal source of data for our purpose. Moreover, by exploiting the cross-country nature of the dataset, we will be able to shed light on the geography of risk attitude, trust and portfolio decisions in Europe, by making a cross-country comparison of the relationship between these variables in eleven European countries characterized by large differences in terms of size, GDP, market capitalization and saving behavior. Finally, the time range considered will help us to control for the influence of the recent 2007-2009 financial crisis.

We document that wide variation in both risk attitude and trust exists across European countries and households: It is also this variation in risk attitude and trust that contributes to explain the well-known large cross-country discrepancies in financial decisions that we observe in Europe (see, e.g., Georgarakos and Pasini, 2011, on this). Our main results, in addition to confirming previous evidence on the correlation between portfolio decisions and socio-demographic characteristics, indicate that risky assets investment is more frequent in the presence of risk tolerance or high levels of trust. Going more in depth, we document that risky assets investments are uncorrelated with trust in the presence of risk tolerance, and positively correlated with trust when households are risk averse – even though the size of this correlation is not as large as the one involving risky assets investment and risk tolerance. Hence, trust seems to act as a substitute – albeit an imperfect one – for risk tolerance.

The remainder of the paper is structured as follows. Section 2 contains a literature review on the importance of individuals' risk attitude and their trust in others for their financial decisions, while in Section 3 we present the data we use to explore the topic. Section 4 contains the main findings of our analysis and Section 5 concludes.

## 2. Literature Review

In this section, we recall some of the major findings obtained so far in the streams of economic literature dealing with the two dimensions that are central for our analysis of financial risk taking, that is *risk attitude* (Sub-section 2.1) and *trust* (Sub-section 2.2).

### 2.1. Risk Attitude

Many scholars have been seeking to identify the major determinants of individuals' predisposition towards risk and, in turn, to understand how risk attitude influences a variety of human behaviors. These behaviors include, among others, financial portfolio management (Xiao et al., 2001), purchase of insurance (e.g., Williams, 1966), preferences for gambles (Kahneman and Tversky, 1979), and even the distance from which people choose to toss a ring onto a pole (McClelland, 1967).

Overall, individuals' risk attitude has been measured in one of three alternative ways: From observable outcome choices such as investment decisions (e.g., Halek and Eisenhauer, 2001; Bucciol and Miniaci, 2011), from choices between hypothetical lotteries (e.g., Guiso and Paiella, 2008; Kimball et al., 2009) or from self-reported measures (e.g., Shaw, 1996; Dohmen et al., 2011). Previous work comparing measures obtained from different sources suggests that simple self-reported measures are highly correlated with more complex measures derived from observable outcomes (Bucciol and Miniaci, 2011) or hypothetical lotteries (Dohmen et al., 2011) and, in the financial domain, they may even be better able to explain actual portfolio decisions than alternative measures (Kapteyn and Teppa, 2011). In this paper, we develop our analysis using a *self-reported* measure of risk attitude.

Relatedly, a relevant question addressed in this literature is the following: Should we focus on individuals' risk attitude *in general* or consider instead *context-specific* measures of risk attitude? Dohmen et al. (2011) present survey-based as well as experimental data documenting substantial heterogeneity in risk attitudes. They show that responses to the qualitative general risk question are a reliable predictor of actual risky behavior, even controlling for a large number of observables. However, they also find that a context-specific measure capturing financial risk attitude is associated with the same individual characteristics correlated with the general risk question (i.e., age, gender, height and parental background). Moreover, their analysis interestingly documents that the single best risk measure in any given context is the measure incorporating the corresponding specific context (see on this also Dohmen et al., 2012). Also Weber and Johnson (2009) report evidence on the domain specificity of risk attitude, arguing that it comes as no surprise that indices like the level of relative risk aversion measure inferred from gambling choices, while widely used, have had only very mixed results in predicting risk taking in other domains. Risk taking seems to be highly dependent on the specific domain in which it is elicited (Loomes and Pogrebna, 2014), also when market data are used (Barseghyan et al., 2011).

Therefore, also in light of the aforementioned studies, in this paper we exclusively rely on a self-reported measure of individuals' risk attitude in the financial domain. In the existing literature, there is robust evidence that this measure is widely heterogeneous in the population and varies with individual characteristics such as age, gender, height, parental background, education, wealth (see, e.g., Barsky et al., 1997; Halek and Eisenhauer, 2001; Bucciol and Miniaci, 2011; Dohmen et al., 2011) as well as parents' willingness to take financial risks (Dohmen et al., 2012).

### 2.2. Trust

As Dohmen et al. (2012) point out, an individual's willingness to trust others captures something fundamental about the way an individual approaches other people. Trust plays a key role in almost all human relationships, from friendship and family ties to economic and financial interactions. Due to its relevance, this notion has attracted the interest of many researchers in different social sciences, and the attention for this topic has been steadily growing during the last decades. Since trust can be viewed as "the belief a person has that his counterpart in a transaction will not take advantage of him" (Guiso, 2010) and legal protection is typically imperfect and costly, it follows that even in advanced countries economic transactions call for a minimum amount of trust to effectively work. As dramatically confirmed by the recent financial crisis, this holds true also for the proper functioning of financial markets.

Generalized trust has been shown to be a relatively stable individual attitude (Ahern et al., 2014), which is consistent with the idea that it is a cultural belief slowly transmitted over time across generations (Butler et al., forthcoming). At the aggregate level, trust has been shown to be related to important economic variables such as GDP growth, the ability of firms to grow larger, and the volume of trade between countries (see Knack and Keefer, 1997; La Porta et al., 1997; Guiso et al., 2009). As to the link between region-specific measures of trust and portfolio decisions, Guiso et al. (2004) show that investment in risky assets is higher if individuals live in (and, more generally, come from) high-social capital areas. Using data from the Dutch National Bank (DNB) Household Survey, Guiso et al. (2008) shed light on the role of individual-level trust in explaining stock market participation and portfolio choices after controlling for general risk attitude. They document that, while the effect of trust is positive and highly significant, individuals' (general) risk attitude has little predictive power. Georgarakos and Pasini (2011) find that living in a region with a higher fraction of people

who trust increases the probability to own stocks.[3] Pevzner et al. (2015) examine the effect of societal trust on investor reactions to corporate earnings announcements and show that these reactions are significantly higher in more trusting countries. They also document that the positive effect of trust is stronger when a country's investor protection and disclosure requirements are weaker.

A crucial question that needs to be addressed in empirical work on trust is the following: What is the best way to measure it? In the last decades, trust has been frequently assessed through laboratory experiments based on the classic 'trust game' design (Berg et al., 1995; Bohnet and Zeckhauser, 2004) or by means of survey data based on self-reported measures of individuals' levels of trust in others. A large number of papers generally measure trust relying on the answer to the World Values Survey (WVS) and General Social Survey (GSS) question: "Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people?"[4] Our analysis makes use of a similar variable. Therefore, we will consider a self-reported measure of so called 'generalized trust', i.e., the amount of trust that individuals have in people they *do not personally know*. Unlike variables capturing trust in friends or relatives (that matter in relational contracts), generalized trust is the component of social capital that has been shown to play a major role for the efficiency of *large-scale*, *anonymous* market economies, as it turned out to be associated with financial development (Guiso et al., 2004) and economic growth (Knack and Keefer, 1997). In other words, to borrow Putnam's (2000) terminology, we will look at a form of *bridging* – rather than *bonding* – social capital, that is what so far seems to be the most economically and socially beneficial type of social capital.[5]

[3] For a recent study focusing on the relationship between an individual's level of trust and her economic performance, see Butler et al. (forthcoming).

[4] In the past few years, scholars tried to validate the power of this measure to give an accurate evaluation of individuals' trust. Fehr et al. (2002), using a large sample of German households, show that the sender behavior in a trust game is correlated with other survey-based measures of trust. Glaeser et al. (2000) challenge this result suggesting that the question provides a measure of trustworthiness rather than trust. Recently, however, Johnson and Mislin (2012) assessed the validity of the WVS trust question using data on experimental trust across countries drawn from 152 replications of the classic Berg et al.'s (1995) Investment Game: Their analysis confirms that the trust question is not correlated with experimentally measured trustworthiness, but also reveals that it is strongly correlated with experimental trust.

[5] While bonding social capital regards the relationships within homogeneous groups (i.e. a family or a group of friends), bridging social capital refers to the links between individuals who belong to different groups (Putnam, 2000).

## 3. Data

We employ data from the Survey on Health, Ageing and Retirement in Europe (SHARE), collected in two periods: 2006 and 2013 (waves 2 and 5).[6] SHARE is an interdisciplinary survey usually run every two years since 2004 on a sample of households whose head is aged 50 or more in a host of European countries (see Börsch-Supan et al., 2008). The eleven countries included in this study range from the North (Sweden and Denmark) to the South (Italy and Spain), from the West (Austria, Belgium, France, Germany, the Netherlands and Switzerland) to the East (Czech Republic) of Europe.[7] In the period under investigation these countries exhibited large differences in terms of population size (from 6 million inhabitants of Denmark to 80 million inhabitants of Germany)[8], per capita GDP (from 15 thousand USD of Czech Republic to 58 thousand USD of Switzerland), stock market capitalization (from 15% of GDP for Italy to 212% of GDP for Switzerland) and saving habits (from 17% of GDP for Italy to 39% of GDP for Switzerland)[9].

The sample is roughly balanced across countries, which means that smaller countries are over-represented. For this reason, and to make our analysis representative of the actual situation in Europe, our subsequent analysis makes use of the weights provided by SHARE.[10] From the original SHARE sample we focus on the household heads, excluding those aged more than 80 who are deliberately over-sampled in the SHARE design, and households with net worth below 10 thousand euros (adjusted for purchasing power parity as of 2013). Our final sample is made of 36,445 observations with full information on our variables of interest.

In the remainder of this section we provide summary statistics on the sample variables (Sub-section 3.1) and specifically on risk attitude and trust (Sub-section 3.2).

[6] Data are freely available at www.share-project.org. Unfortunately we cannot include further waves. Questions on risk attitude and trust in others – the two key dimensions in this study – are asked only in the waves 2, 4 and 5. However, wave 4 is not comparable to the others: In such wave, the questions of interest were asked only to the individuals newly entered in the sample, that were selected to be younger than the original sample (in order to reduce the overall sample age and keep it constant across waves).

[7] From the original sample we exclude countries that are present in one wave only, that is Greece and Poland (interviewed in wave 2) and Estonia, Luxembourg and Slovenia (interviewed in wave 5). We also exclude Israel, present in both waves, to focus on European countries only.

[8] United Nations – World Population Prospects: http://esa.un.org/unpd/wpp/Excel-Data/population.htm, year 2010.

[9] Source for this and the previous three statistics: World Bank – World Development Indicators: http://data.worldbank.org/indicator/, year 2010.

[10] We use the calibrated cross-sectional weights at the household level in the main sample, which are more appropriate for our analysis.

### 3.1. Summary Statistics

Our analysis makes use of the variables whose summary statistics are reported in Table 1. In addition to the variables on risk tolerance and trust, described in detail in Sub-section 3.2, we have information on the standard socio-demographic variables (e.g., age, gender, education) and economic variables (home-ownership, income, net worth adjusted for purchasing power parity).[11] The table documents that the average individual is aged 64 and likely to own the house she lives in. Since the respondents are 50 years old or more, most of them are married and have children. For the same reason, only a relatively small fraction of individuals is still working. As for education attainment, roughly half of the sample does not have high school or higher degree. This variable can have a great impact on risk attitude since, as pointed out in Sub-section 2.1, the lack of financial knowledge significantly increases risk aversion and decreases the probability of buying risky assets: Individuals with limited education background may not have the necessary knowledge to be able to purchase risky assets.

TABLE 1 ABOUT HERE

In this paper we measure portfolio decisions as follows. We consider the financial portfolio as made of bank accounts, contractual savings, life insurances, government and corporate bonds, retirement accounts, mutual funds and stocks, i.e., all the financial instruments recorded in SHARE. For our analysis, we focus on the riskier categories – stocks, bonds and mutual funds – that we generically label risky assets.[12] In the analysis we define two variables, namely the *risky assets holding* and the *risky assets share*. The former is a binary variable equal to one if the household owns any risky assets, while the latter is the share of the financial portfolio held in risky assets.

Figure 1 depicts for each SHARE country the proportion of households holding risky assets (panel a) and the average portfolio share in risky assets (panel b). The pattern displays wide heterogeneity, going from a 9.75% holders and a 4.21% share in Spain to a 71.24%

[11] Monetary values are purchasing power parity adjusted and converted in 2013 euros. Variables on net worth and amounts invested in single financial assets come from the imputation file. SHARE reports a set of five different imputations per observation; we take their average. Imputed data are estimates of monetary values of interest for individuals who did not supply an answer and coincide with observed data in all the other cases. Ignoring the observations with missing data would lead to inefficient and possibly biased estimates; the imputed data are computed taking into account the information the respondent directly supplies in the survey.

[12] Wave 5 collects information on these asset types together, making no distinction between stocks, bonds and mutual funds. This prevents us from considering a narrower definition of risky assets. Moreover, we prefer not to include retirement plans in our definition of risky assets, because of their widely different institutional characteristics within European countries.

holders and a 27.50% share in Sweden. In general, Southern and Eastern European countries are less likely to own risky assets than Northern and Western countries. This heterogeneity may be due to several reasons, including variations in the institutional framework and the development of the financial sector, but also variations in risk tolerance and levels of trust in others.

FIGURE 1 ABOUT HERE

### 3.2. Risk Tolerance and Trust

SHARE asks the following question to detect individuals' self-assessed attitude towards financial risk. The question is the same as in the US Survey of Consumer Finances:

> *"When people invest their savings they can choose between assets that give low return with little risk to lose money, for instance a bank account or a safe bond, or assets with a high return but also a higher risk of losing, for instance stocks and shares. Which of the statements on the card comes closest to the amount of financial risk that you are willing to take when you save or make investments?*
>
> *1. Take substantial financial risks expecting to earn substantial returns*
> *2. Take above average financial risks expecting to earn above average returns*
> *3. Take average financial risks expecting to earn average returns*
> *4. Not willing to take any financial risks"*

Given the high concentration of answers (68.43%) in the last option, in our analysis we consider a binary variable equal to 0 if the individual is "not willing to take any financial risks" and 1 otherwise. As a result the variable, that we label *risk tolerance*, indicates whether the individual is risk tolerant or not.[13] Panel a) of Figure 2 displays the proportion of risk tolerant individuals in each country according to this variable. The proportion ranges from 9.13% for Spain to 52.78% for Denmark. It is immediately evident that huge variation exists across European areas: We indeed find more frequent risk tolerance in Northern and Western Europe, and less frequent tolerance in Eastern and Southern countries, in a way similar to the distribution of risky assets displayed in Figure 1.

[13] Another reason to use a binary variable is that it makes it easier to interpret the results when interacted with trust.

SHARE also asks the respondent to state her own level of trust in others (i.e., generalized trust). The question is similar to the one included in the World Value Survey:[14]

> *"I would now like to ask a question about how you view other people. Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people?*
> *Please tell me on a scale from 0 to 10, where 0 means you can't be too careful and 10 means that most people can be trusted."*

Answers are split along the whole scale, although 68.23% of the respondents declare a trust level between 5 and 8, with a mode on 5 (chosen by 21.55% of the respondents). In the analysis we consider this variable, that we label *trust*, divided by 10 to take values in the 0-1 range. The variable is highly correlated with risk tolerance: On average it is equal to 0.59 among risk tolerant households, and 0.54 among risk averse households. The difference is significant according to a mean-comparison F-test (p-value <0.01).

Panel b) of Figure 2 displays the average levels of trust in the countries we analyze. Trust ranges from 0.49 for France to 0.76 for Denmark, and its ranking is in line with that from other sources.[15] The pattern identified by this variable is similar to the one of risk tolerance: It turns out that Northern countries overall display high levels of trust, while Southern countries display low levels of trust.[16] Our graphical evidence from Figure 2 then reveals the existence of a positive correlation between generalized trust and risk tolerance, and the comparison with Figure 1 suggests that both dimensions – not unexpectedly – are positively correlated with the decision to invest in risky assets.

FIGURE 2 ABOUT HERE

The main goal of this paper, however, is to explore the role *jointly played* by risk tolerance and trust in others in influencing risky portfolio choices. To gain further insights on this, in Table 2 we split the eleven countries in different groups based on their aggregate

[14] The only difference is that, in our data, the answer is reported in a 0-10 scale rather than as "yes" or "no".

[15] In particular, the ranking is similar to the one based on the answer to the analogous WVS question (waves 2005-2014). It is worth noting, however, that WVS looks at only seven out of the eleven countries included in our analysis.

[16] This picture is compatible with prior work on trust and social capital in Europe, showing that, while Scandinavian countries are characterized by high levels of generalized trust, this is not the case for Mediterranean countries (see e.g., Guiso et al., 2008), possibly due to the role played by so called 'amoral familism', i.e., by a form of bonding – rather than bridging – social capital.

levels of risk tolerance and trust. That is, we exploit the heterogeneity that characterizes European countries with regard to risk tolerance and trust in others, and rank these countries based on the two dimensions: This allows us to classify the countries into four groups, that is countries endowed with (1) risk tolerance and high trust; (2) risk tolerance and low trust; (3) risk aversion and high trust and (4) risk aversion and low trust.

Group 1 includes Denmark and Sweden, i.e., those (Nordic) countries ranking in the top positions on both risk tolerance and trust. Group 4 includes France, Italy and Spain, i.e., those (mainly Southern) countries ranking in the bottom positions on both risk tolerance and trust. Interestingly, Nordic and Southern countries are at the extreme ranking positions in risk tolerance and trust in others. The remaining countries are assigned to either Group 2 or Group 3 depending on the dimension (i.e. risk or trust) on which they rank higher. Group 2 (risk tolerance and low trust) includes Belgium, Czech Republic and Germany, while Group 3 (risk aversion and high trust) includes Austria, the Netherlands and Switzerland.

Table 2 reports, for each group, the average levels of risk tolerance, trust and risky assets investments. We notice that, not surprisingly, risky assets investment is much more widespread in the countries characterized by more frequent risk tolerance (i.e., Groups 1 and 2).

However, risky assets are more frequently held in Group (1) than in Group (2), and in Group (3) than in Group (4), that is, in those countries featuring high trust compared to countries with low trust and similar risk tolerance. In particular, Table 2 also reveals that trust plays a key role in countries where it is high and risk tolerance is infrequent: If we compare two groups of countries characterized by a similarly low frequency of risk tolerance but endowed with different levels of trust (Groups 3 and 4), we notice that in the group where trust is relatively high (i.e., Group 3), both the holding and the share indicators are significantly higher than in the group where trust is relatively low (i.e., Group 4).

TABLE 2 ABOUT HERE

From this preliminary analysis we conclude that there seems to be a positive link between risk tolerance and trust in others, and that risky investments are more frequent in the presence of trust. In Section 4 we explore this relationship controlling for risk tolerance as well as socio-demographic and economic variables.

## 4. Empirical Analysis

In this section we relate different measures of financial risky assets investments to socio-demographic variables and the self-assessed levels of risk attitude and trust in others. We consider several regression models, differing in the dependent variable and in the specification. In all the cases we use robust standard errors clustered at the country level. In the following we comment only on average marginal effects that are significant at least at the 5% level.

In Table 3 we report average marginal effects from logit regressions taking as dependent variable a binary indicator equal to one if the household owns risky assets in its financial portfolio. The first model in Column (1) takes as explanatory variables standard socio-demographic characteristics of the individuals and a set of country dummies to capture the cross-country (cultural and institutional) differences. The output of this regression generally confirms the standard findings in the literature: Risky assets holding is positively correlated with income, wealth, education and good health status, and negatively correlated with home ownership, being a female or having children (see, e.g., Halek and Eisenhauer, 2001; Bucciol and Miniaci, 2015).

Column (2) enriches the specification by including a variable on the level of trust, as already done in the literature. The variable is highly significant although its effect is quantitatively small: Going from the bottom to the top of the scale, i.e., from 0 to 1, corresponds to a 5.88% increase in the probability to hold risky assets. Moreover, the other coefficients are roughly unchanged with respect to Column (1) and the overall fit of the model, as measured by the pseudo-$R^2$ statistic, is virtually unchanged with respect to Column (1).

Column (3) further adds to the specification a binary variable on risk tolerance. The newly added variable is highly significant and its effect is quantitatively large; risk tolerant individuals have a 19.59% higher probability to hold risky assets. This is a large amount, if we consider that only 28.6% of the households in the sample invest in risky assets. Furthermore, the introduction of the risk tolerance variable makes the coefficients on gender insignificant (confirming that risk attitude also varies with socio-demographic characteristics, as in Halek and Eisenhauer, 2001) and improves the overall fit of the model, with the pseudo-$R^2$ increasing by about 4 percentage points from Column (2). The effect of the variable on

trust is still significant, but it is now smaller (3.84%).[17] Hence, unlike previous work on the theme (see, e.g., Guiso et al., 2008), trust does not seem to capture a key dimension to explain portfolio choice – plausibly because of its high correlation with our measure of risk tolerance.

Our major goal, however, is to understand whether trust *alone*, in the presence of risk averse households, correlates with risky assets investment. To reach this goal, Column (4) replaces the trust variable from the previous specification with two interaction terms between trust and the binary variable for risk tolerance. In so doing we end up with the variables *trust* × *risk tolerance*, isolating the contribution of trust in the presence of risk tolerance, and *trust* × *(1-risk tolerance)*, denoting the contribution of trust in the presence of risk aversion. Interestingly we find that the effect of trust with risk tolerance is insignificant, while the effect of trust with risk aversion is significantly positive and equal to 6.03%. The size of this effect is still quantitatively small: Going from the bottom to the top of the trust scale, the probability to hold risky assets would increase by 6.03%, i.e., less than one third of the effect of being risk tolerant (23.79%). The results for the other explanatory variables keep stable also with this specification.

Finally, it is worth noting that the year of the survey plays a role in the specification after the inclusion of information on risk tolerance in the model: Columns (3) and (4) show that risky asset investment was about 3% less likely in 2013 compared to 2006, everything else being equal. Not unexpectedly, the recent financial crisis induced households to be more reluctant to make risky investments.

Taken together, the evidence in Column (4) suggests that trust acts as a *substitute* for risk tolerance: When risk tolerance is present, trust is irrelevant on the decision to hold risky assets. In contrast, when households are risk averse, trust does play a role and has a positive impact on risky assets holdings: Thanks to their trust in others, people are willing to take financial risks despite the lack of risk tolerance. However, our analysis also indicates that the trust substitute is clearly an *imperfect* one, as the highest possible level of trust has an effect on the holding that is far from the one of risk tolerance.

TABLE 3 ABOUT HERE

[17] This result is in contrast with Guiso et al. (2008), who find in a similar regression model a non-significant effect of risk tolerance on Dutch data. Our benchmark results, however, are confirmed also when restricting our attention to the sub-sample of Dutch households. Therefore, we are inclined to believe that the different results can be attributed to the way risk tolerance is measured: By means of a self-assessed, domain-specific question on financial risk attitude in our paper and by a general hypothetical lottery question in Guiso et al. (2008). As indicated by the recent stream of empirical literature recalled in Sub-section 2.1, we view our measure of risk attitude as more appropriate for the analysis of financial risk taking.

In Table 4 we replicate the analysis taking as dependent variable the financial portfolio share in risky assets rather than the binary variable informing on the holding. In this case we are interested in examining the intensity of the investment decision rather than the decision itself. Since the new variable is a fraction, we employ a fractional response logit model estimated with Bernoulli quasi-maximum likelihood as in Papke and Wooldridge (1996). The main advantage of this model, compared to alternatives such as an OLS regression, is to acknowledge that the dependent variable takes values within the 0-1 range, possibly with a mass of observations concentrated at the boundaries. Table 4 displays average marginal effects from this model; estimates based on the OLS model provide similar results and are available upon request.

This new analysis supports our previous findings, and indicates that *trust contributes to explain risky assets investments, but only when risk tolerance is absent*. Specifically, for a risk averse individual a rise in the trust scale from the bottom of the top is associated to a 3.94% increase in the portfolio share held in risky assets – again, about one third of the effect of being risk tolerant (12.47%).

TABLE 4 ABOUT HERE

### 4.1. Sensitivity Analysis

We are aware that our analysis may suffer from omitted variables, such as financial literacy and background family conditions. We cannot exclude that these and other unobservable factors affect trust, risk attitude and financial investment behavior. Potentially, our previous results could then be biased by the absence of this information.

As a robustness check we then perform the "Generalized Sensitivity Analysis" (henceforth GSA) developed by Harada (2013), a refinement of the original "sensitivity analysis" of Imbens (2003).[18] GSA tests under which conditions the estimate of one significant regression coefficient (the assignment) becomes insignificant. In a nutshell, GSA generates a sequence of pseudo-random variables that, once added to the regression equation, make the coefficient of interest insignificantly different from zero.

[18] The algorithm is a refinement because it can be applied to any type of treatment, outcome and unobservable variables (not just dummies), and it estimates the correlations of the pseudo-random variables more precisely. We use the "gsa" Stata module developed by Harada (2013).

Figure 3 plots the output of this analysis, that we develop on the models in Column (4) of Tables 3 and 4, to check when the coefficient on *trust* × *(1-risk tolerance)* becomes insignificant. The lines in Figure 3 plot the correlation between the pseudo-random variables and the assignment (on the x-axis) and the outcome variable (on the y-axis) that in our case is either the dummy variable on risky asset holding (panel a) or the risky asset share (panel b). For comparability purposes, Figure 3 also plots the corresponding correlation involving the most significant observable variables included in the specification.

The figure shows that the unobservable variables should have correlations stronger than the observable variables to make insignificant the effect of trust under risk aversion. In particular, since it is difficult to believe that our analysis omits unobservable variables more highly correlated with risky asset investment than income, wealth and home ownership, we conclude that our findings are robust to potential unobserved confounders.

FIGURE 3 ABOUT HERE

## 5. Conclusion

Individual behavior towards financial investments has been attracting the attention of a number of scholars since a long time. Previous evidence documents that financial portfolio composition is widely heterogeneous in the population, and correlates with a number of individual-level characteristics. Our empirical analysis, based on SHARE survey data collected in year 2006 and 2013, explores the connection between financial risk attitude and trust in others to examine their impact on portfolio choice across European countries.

Unlike previous work dealing with a similar research question, our major goal was to disentangle the contribution of trust from that of financial risk attitude: We conjectured that disentangling risk attitude from trust in others and then analyzing them together in the same models could help illuminate the underlying mechanisms behind investors' portfolio decisions, which prior work had separately tied to both risk attitude and trust (see Ahern et al., 2014, for considerations on this). Our main findings can be summarized as follows: (1) First, financial risk attitude plays an extremely important role in explaining investors' portfolio choices; (2) Second, also trust does matter, but only when the household is risk averse, in which case risky assets investment is more frequent in the presence of higher trust. We then

argue that trust acts as a substitute for risk tolerance: It becomes important for portfolio decisions only when households are risk averse. This substitute, however, is imperfect in the sense that its effect on risky assets investment is quantitatively much smaller than that of risk tolerance.

In his 1972 work, *The Limits of Organization*, Kenneth Arrow famously described trust as an important lubricant of a social system. Our study, showing that trust in risk averse environments helps to increase risky assets investments, provides insights into an important microeconomic channel through which trust can act as a lubricant of the economic system: Its ability to act as a substitute (albeit an imperfect one) for risk tolerance in shaping individuals' portfolio decisions. This corroborates the idea that promoting interpersonal trust – in addition to improving person-specific attributes such as, e.g., one's level of financial literacy – could significantly contribute to the development of financial markets.

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**Table 1.** Summary statistics (36,445 observations)

| Variable | Mean | Std. dev. | Min. | Max. |
|---|---|---|---|---|
| Age | 63.969 | 8.486 | 50 | 80 |
| Female *(dummy)* | 0.528 | 0.499 | 0 | 1 |
| Foreign *(dummy)* | 0.065 | 0.246 | 0 | 1 |
| High school *(dummy)* | 0.343 | 0.475 | 0 | 1 |
| College *(dummy)* | 0.214 | 0.410 | 0 | 1 |
| Worker *(dummy)* | 0.307 | 0.461 | 0 | 1 |
| Good health *(dummy)* | 0.260 | 0.438 | 0 | 1 |
| Married *(dummy)* | 0.705 | 0.456 | 0 | 1 |
| With children *(dummy)* | 0.874 | 0.332 | 0 | 1 |
| Home owner *(dummy)* | 0.862 | 0.345 | 0 | 1 |
| Income (k euros) | 32.008 | 51.146 | 0.003 | 8,783.368 |
| Net worth (k euros) | 316.114 | 498.842 | 10.009 | 1,530.000 |
| Year 2013 *(dummy)* | 0.526 | 0.499 | 0 | 1 |
| *Variables of interest* | | | | |
| Risky asset holding *(dummy)* | 0. 286 | 0.452 | 0 | 1 |
| Risky asset share | 0. 133 | 0.268 | 0 | 1 |
| Self-assessed risk tolerance *(dummy)* | 0. 258 | 0.438 | 0 | 1 |
| Trust | 0.551 | 0.246 | 0 | 1 |

**Table 2.** Risk taking by country group

| Group | Risky asset holding | Risky asset share | Risk tolerance | Trust |
|---|---|---|---|---|
| (1) Risk tolerance, High trust *(Denmark, Sweden)* | 0.629 | 0.237 | 0.516 | 0.715 |
| (2) Risk tolerance, Low trust *(Belgium, Czech Republic, Germany)* | 0.359 | 0.155 | 0.316 | 0.554 |
| (3) Risk aversion, High trust *(Austria, Netherlands, Switzerland)* | 0.280 | 0.115 | 0.285 | 0.636 |
| (4) Risk aversion, Low trust *(France, Italy, Spain)* | 0.214 | 0.115 | 0.197 | 0.518 |
| *TOTAL* | *0.286* | *0.133* | *0. 258* | *0.551* |

Note: We group countries based on their ranking on the frequency of risk tolerance and average trust. We include in Group 1 the countries that consistently rank in the top positions on both risk tolerance and trust. We include in Group 4 the countries that consistently rank in the bottom positions on both risk tolerance and trust. The remaining countries are included in Group 2 if they rank higher on risk tolerance, or in Group 3 if they rank higher on trust. One-way analysis of variance and paired t-tests always reject the null hypothesis of identical holding and share of risky assets in any pair of groups.

**Table 3.** Average marginal effects (multiplied by 100) on risky asset holdings

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Risk tolerance | | | 19.590*** | 23.788*** |
| | | | (0.626) | (2.290) |
| Trust | | 5.884*** | 3.840*** | |
| | | (1.217) | (1.445) | |
| Trust × risk tolerance | | | | -1.265 |
| | | | | (3.374) |
| Trust × (1-risk tolerance) | | | | 6.029*** |
| | | | | (1.717) |
| Age/10 | -0.929* | -0.985* | 0.192 | 0.227 |
| | (0.508) | (0.506) | (0.454) | (0.457) |
| Female | -3.304*** | -3.348*** | -0.974 | -0.968 |
| | (0.631) | (0.620) | (0.711) | (0.724) |
| Foreign | -2.835 | -2.856 | -2.127 | -2.117 |
| | (2.441) | (2.371) | (2.031) | (2.003) |
| High school | 5.341*** | 5.143*** | 3.798*** | 3.802*** |
| | (0.918) | (0.883) | (0.636) | (0.655) |
| College | 7.917*** | 7.504*** | 4.862*** | 4.915*** |
| | (0.727) | (0.751) | (0.833) | (0.792) |
| Worker | -2.592*** | -2.678*** | -2.675*** | -2.639*** |
| | (0.753) | (0.747) | (0.783) | (0.801) |
| Good health | 3.130*** | 2.873*** | 2.227** | 2.242** |
| | (0.728) | (0.739) | (0.906) | (0.899) |
| Married | 1.168 | 1.164 | 1.496 | 1.485 |
| | (1.267) | (1.235) | (1.226) | (1.220) |
| With children | -5.274*** | -5.200** | -4.631** | -4.644** |
| | (2.012) | (2.041) | (1.911) | (1.911) |
| Home owner | -17.316*** | -17.257*** | -14.734*** | -14.728*** |
| | (2.356) | (2.328) | (2.016) | (2.023) |
| Ln(Income) | 3.761*** | 3.699*** | 2.795*** | 2.782*** |
| | (0.697) | (0.679) | (0.636) | (0.619) |
| Ln(Net worth) | 12.237*** | 12.188*** | 10.401*** | 10.430*** |
| | (0.674) | (0.671) | (0.619) | (0.618) |
| Year 2013 | -2.559 | -2.729* | -3.486*** | -3.479*** |
| | (1.598) | (1.529) | (1.288) | (1.267) |
| Country dummies | YES | YES | YES | YES |
| Pseudo-$R^2$ | 0.173 | 0.174 | 0.218 | 0.218 |
| Log pseudo-likelihood | -51,215,911 | -51,156,907 | -48,406,635 | -48,384,420 |
| Observations | 36,445 | 36,445 | 36,445 | 36,445 |

Note: The table reports average marginal effects from a logit regression. Standard errors clustered at the country level in parentheses; *** p<0.01, ** p<0.05, * p<0.1

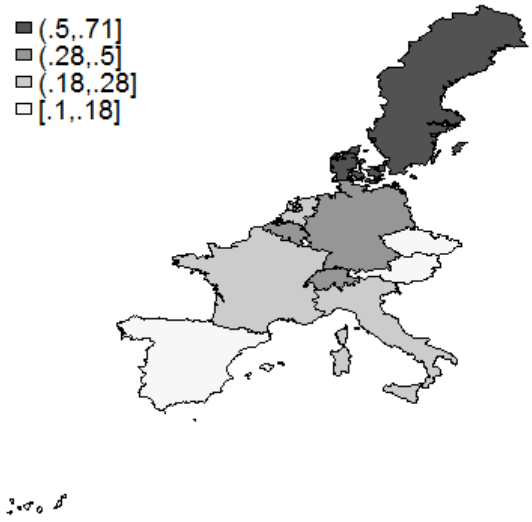
**Table 4.** Average marginal effects (multiplied by 100) on risky asset share

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Risk tolerance | | | 9.088*** | 12.465*** |
| | | | (0.421) | (1.785) |
| Trust | | 2.722*** | 1.702*** | |
| | | (0.341) | (0.346) | |
| Trust × risk tolerance | | | | -1.820 |
| | | | | (1.704) |
| Trust × (1-risk tolerance) | | | | 3.935*** |
| | | | | (1.169) |
| Age/10 | 0.583 | 0.566 | 1.090 | 1.133* |
| | (0.806) | (0.795) | (0.684) | (0.664) |
| Female | -1.049*** | -1.079*** | 0.029 | 0.045 |
| | (0.399) | (0.400) | (0.410) | (0.415) |
| Foreign | -0.221 | -0.235 | 0.008 | 0.019 |
| | (0.739) | (0.715) | (0.623) | (0.620) |
| High school | 3.196*** | 3.099*** | 2.496*** | 2.502*** |
| | (0.490) | (0.473) | (0.430) | (0.443) |
| College | 3.879*** | 3.685*** | 2.424*** | 2.481*** |
| | (0.299) | (0.319) | (0.316) | (0.285) |
| Worker | -2.747*** | -2.787*** | -2.832*** | -2.799*** |
| | (0.694) | (0.700) | (0.729) | (0.748) |
| Good health | 1.113*** | 0.996*** | 0.775* | 0.803* |
| | (0.330) | (0.342) | (0.417) | (0.419) |
| Married | -0.155 | -0.162 | -0.041 | -0.063 |
| | (0.871) | (0.849) | (0.855) | (0.836) |
| With children | -2.957*** | -2.932*** | -2.731*** | -2.746*** |
| | (0.626) | (0.646) | (0.562) | (0.555) |
| Year 2013 | -0.355 | -0.433 | -0.821 | -0.827 |
| | (1.276) | (1.242) | (1.096) | (1.076) |
| Home owner | -7.566*** | -7.565*** | -6.788*** | -6.826*** |
| | (1.548) | (1.533) | (1.444) | (1.458) |
| Ln(Income) | 1.447*** | 1.417*** | 1.035*** | 1.030*** |
| | (0.280) | (0.271) | (0.270) | (0.261) |
| Ln(Net worth) | 4.982*** | 4.980*** | 4.338*** | 4.388*** |
| | (0.516) | (0.512) | (0.514) | (0.522) |
| Country dummies | YES | YES | YES | YES |
| Pseudo-$R^2$ | 0.121 | 0.121 | 0.157 | 0.157 |
| Log pseudo-likelihood | -31,820,714 | -31,791,378 | -30,517,758 | -30,485674 |
| Observations | 36,445 | 36,445 | 36,445 | 36,445 |

Note: The table reports average marginal effects from a fractional response logit model. Standard errors clustered at the country level in parentheses; *** p<0.01, ** p<0.05, * p<0.1

**Figure 1.** Distribution of risky assets investments

a) Fraction of risky assets holders




b) Average risky assets share

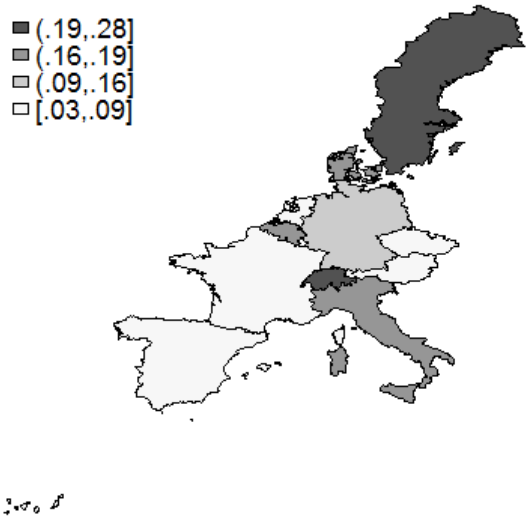
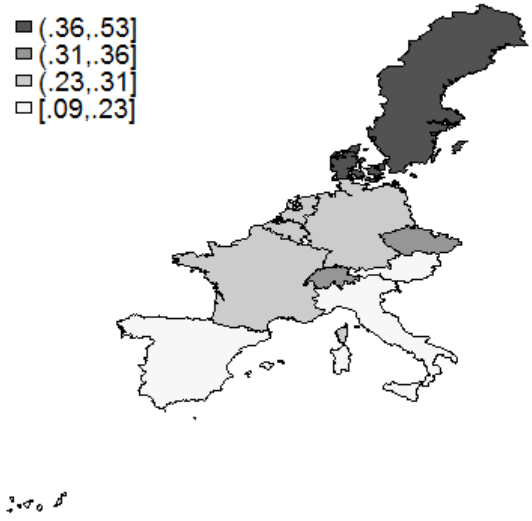



**Figure 2.** Distribution of risk tolerance and trust

a) Fraction of risk tolerant households




b) Average trust level

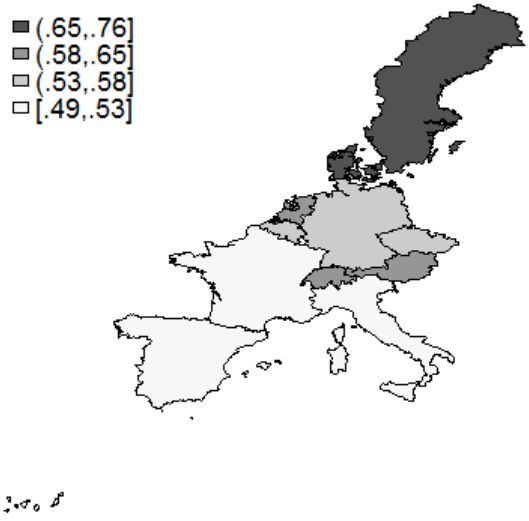
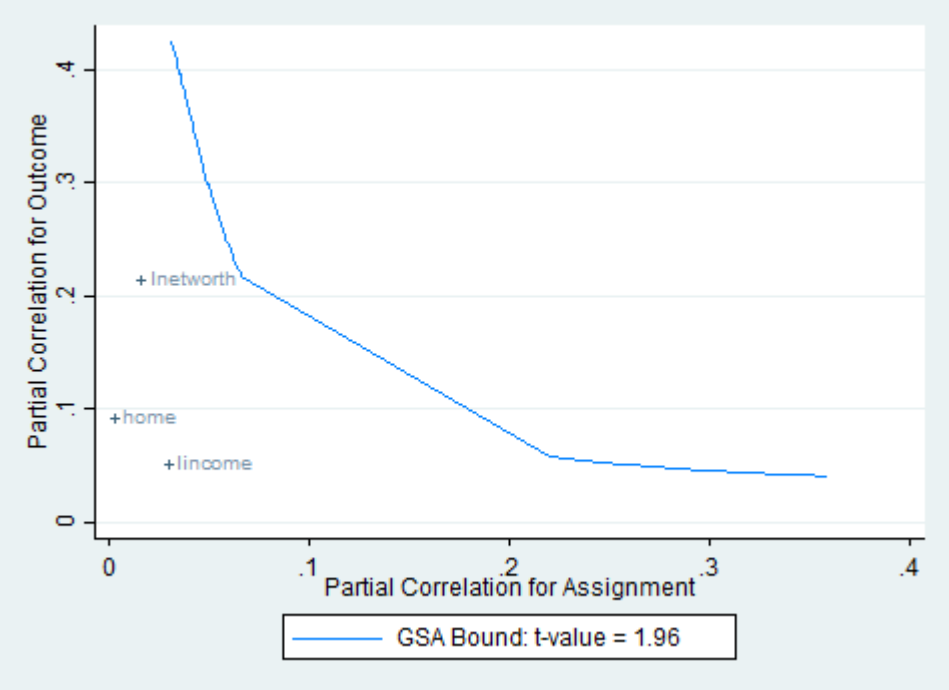


**Figure 3.** Generalized sensitivity analysis on the regression models

a) Risky asset holding




b) Risky asset share